

Focal width - the segment thru the focus perpendicular to the axis of symmetry. Its endpoints lie on the parabola and has length = (parallel to the directrix) $|4p|$

Axis of Symmetry - line \perp to the focal width & directrix. It intersects the parabola at the vertex.

measure from the focus to an endpt of the focal width =
measure from the focus to the directrix.

Parabola - standard form


up/down

$$y = a(x - h)^2 + k$$

$p = \frac{1}{4a}$ therefore, $a = \frac{1}{4p}$

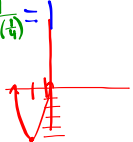
vertex	(h, k)
focus	$(h, k + p)$
directrix	$y = k - p$
axis	$x = h$
focal length	p
focal width	$ 4p $

Graph: $y = 2(x - 3)^2 + 1$ $p = \frac{1}{4a} = \frac{1}{4(2)} = \frac{1}{8}$



vertex $(3, 1)$
 focus $(3, 1\frac{1}{8})$
 directrix $y = 7/8$
~~axis~~
 focal length $\frac{1}{8}$
~~scribble~~

Graph: $y = \frac{1}{4}(x + 2)^2 - 5$ $p = \frac{1}{4a} = \frac{1}{4(1/4)} = 1$



vertex $(-2, -5)$
 focus $(-2, -4)$
 directrix $y = -6$
~~scribble~~
 focal length 1
~~focal width~~

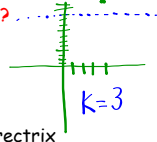
Example:
 Write the equation for a parabola with Focus: $(4, 3\frac{1}{4})$ and directrix: $y = 2\frac{3}{4}$

What information do you need to write the equation of a parabola?
 $y = a(x - h)^2 + k$ a, h, k

What do we have? What do we need to find?
 $h = 4$ a, k

To find K: What do we know about the relationship between the point k and distance to the focus and the directrix?

k is in the middle $(4, 3\frac{1}{4})$
 $y = 2\frac{3}{4}$ $k = 3$



k is the midpoint between the focus and the directrix

To find a: Remember $p = \frac{1}{4a}$ what did we learn above that allows us to find p? How can we find a once we know p?

$a = \frac{1}{4p} = \frac{1}{4(1)} = \frac{1}{4} = 1$

Now we know h, k, and a we can write the equation in vertex form:

$$y = 1(x-4)^2 + 3$$

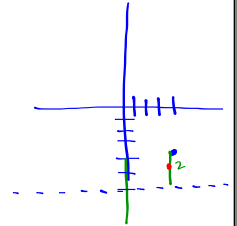
Write the equation for a parabola with F: (4, -4) and directrix $y = -6$

$$p = 1$$

$$a = \frac{1}{4p} = \frac{1}{4(1)} = \frac{1}{4}$$

$$k = -5$$

$$y = \frac{1}{4}(x-4)^2 - 5$$



Write the equation for a parabola with F: (-3, -2) and directrix $y = 6$

$$p = 4$$

$$k = 2$$

$$a = \frac{1}{4p} = \frac{1}{4(4)} = \frac{1}{16}$$

$$y = -\frac{1}{16}(x+3)^2 + 2$$

